

CLAIMS

- 1 1. A membrane electrode assembly for use in a direct oxidation fuel cell comprising:
2 a layer of material which is substantially impermeable to water and carbonaceous
3 fuel;
4 first and second protonically conductive membranes disposed, respectively, on
5 opposite surfaces of said layer;
6 selected sites in said layer enabling protonically conductive contact between said
7 first and second membranes;
8 first and second catalysts disposed, respectively, on the surfaces of said mem-
9 branes which are not in contact with said layer; and
10 first and second diffusion material layers disposed, respectively, on the surfaces
11 of said catalysts which are not in contact with said membranes.
- 1 2. The assembly as in claim 1 wherein said layer comprises a microporous material.
- 1 3. The assembly as in claim 1 wherein said layer comprises a polyester microfilm
2 with microperforations.
- 1 4. The assembly as in claim 1 wherein said layer comprises a polyimide film with
2 microperforations.
- 1 5. The assembly as in claim 1 wherein said assembly is used in a direct methanol
2 fuel cell.
- 1 6. A layered membrane for use in a direct oxidation fuel cell comprising:
2 a layer of material which is substantially impermeable to water and carbonaceous
3 fuel; and
4 first and second protonically conductive membranes disposed, respectively, on
5 opposite surfaces of said layer; and

6 selected sites in said layer enabling protonically conductive contact between said
7 first and second membranes.

1 7. The membrane as in claim 6 wherein said layer comprises a microporous material.

1 8. The membrane as in claim 6 wherein said layer comprises a polyester microfilm
2 with microperforations.

1 9. The membrane as in claim 6 wherein said layer comprises a polyimide film with
2 microperforations.

1 10. The membrane as in claim 6 wherein said membrane is used in a direct methanol
2 fuel cell.

1 11. A method of constructing a layered membrane for use in a direct oxidation fuel
2 cell comprising the steps of:

3 providing a layer of material which is substantially impermeable to water and car-
4 bonaceous fuel; and

5 providing, on opposite sides of said layer, protonically conductive membranes;

6 and providing sites in said layer which allow protonically conductive contact be-
7 tween said protonically conductive membrane.

1 12. The method as in claim 11 wherein said layer comprises a microporous material.

1 13. The method as in claim 11 wherein said layer comprises a polyester microfilm
2 with microperforations.

1 14. The method as in claim 11 wherein said layer comprises a polyimide film with
2 microperforations.

1 15. A method of constructing a membrane electrode assembly for use in a direct ox-
2 idation fuel cell comprising the steps of:

3 providing a layer of material which is substantially impermeable to water and car-
4 bonaceous fuel and which permeable to protons;

5 providing, on opposite sides of said layer, first and second protonically conduc-
6 tive membranes;

7 providing sites in said layer which allow protonically conductive contact between
8 said protonically conductive membrane; and

9 providing, on the surfaces of said membranes which are not in contact with said
10 layer, first and second catalyst layers; and

11 providing, on the surfaces of said first and second catalyst layers which are not in
12 contact with said membranes, first and second distribution layers.

1 16. The method as in claim 15 wherein said layer comprises a microporous material.

1 17. The method as in claim 15 wherein said layer comprises a polyester microfilm
2 with microperforations.

1 18. The method as in claim 15 wherein said layer comprises a polyimide film with
2 microperforations.

1 19. A direction oxidation fuel cell comprising:

2 an anode;

3 a cathode;

4 a membrane electrode assembly, said assembly including a layer of material

5 which is substantially impermeable to water and fuel, first and second protonically con-
6 ductive membranes disposed, respectively, on opposite surfaces of said layer, sites in said
7 layer that allow protonically conductive contact between said membranes, first and sec-
8 ond catalysts disposed, respectively, on the surfaces of said membranes which are not in
9 contact with said layer, and first and second diffusion material layers disposed, respec-
10 tively, on the surfaces of said catalysts which are not in contact with said membranes; and

11 a housing in which said anode, cathode and assembly are disposed.

1 20. The fuel cell as in claim 19 wherein said layer comprises a microporous material.

1 21. The fuel cell as in claim 19 wherein said layer comprises a polyester microfilm
2 with microperforations.

1 22. The fuel cell as in claim 19 wherein said layer comprises a polyimide film with
2 microperforations.

1 23. The fuel cell as in claim 19 wherein said fuel cell is a direct methanol fuel cell.